

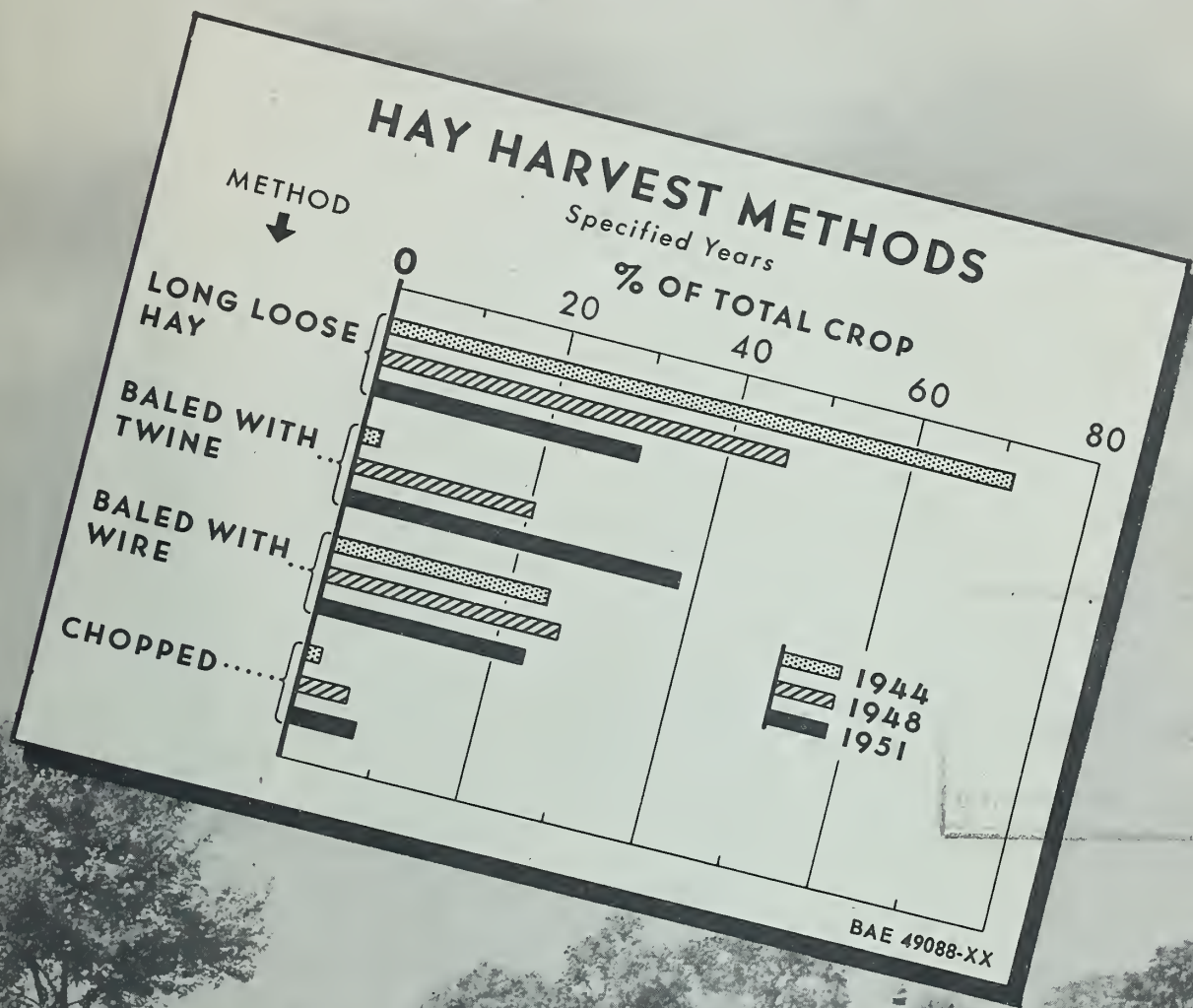
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Harvesting

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HAY AND STRAW and Use of Balers



UNITED STATES DEPARTMENT OF AGRICULTURE
7 U.S. BUREAU OF AGRICULTURAL ECONOMICS

50 WASHINGTON, D. C.

June 1953

F.M.
107

X HARVESTING HAY AND STRAW
AND
USE OF BALERS X

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Methods of harvesting hay have changed throughout the country in recent years. As a rule, these changes mean less labor per ton of hay, but greater investment in hay-making machines; they mean greater ease and speed in handling the hay crop at harvest and at feeding time; and frequently, they mean hay of better quality with less space required for storing it.

Some of the newer harvesting methods require machines that are too expensive to be used in handling small tonnages of hay. But many of them are used to harvest hay for several farmers. In this way costs are reduced and a farmer who has only a small tonnage of hay has the use of modern methods. 1/

This report, the fourth published by the Bureau of Agricultural Economics from 1940 to 1953 contains historical information on methods of harvesting hay. The data apply to the crops of 1939, 1944, 1948, and 1951. Inclusion here of some of the data from the earlier studies affords a measure of the main changes that occurred in harvesting methods in the 13 years. Data showing these historical

1/ For labor requirements and costs for several harvesting methods see Hay Harvesting Methods and Costs, by Robert E. Marx and James W. Birkhead, U. S. Dept. Agr. Cir. 868, June 1951.

changes are brought up-to-date from time to time for the use of farmers and manufacturers of haying equipment and supplies.

Many of the basic data used in the preparation of each report were supplied by voluntary crop reporters of the United States Department of Agriculture. For this report the basic information on methods of harvesting hay was reported on a special questionnaire mailed with the February 1952 general schedule. Usable replies were received from about 25,000 farmers, who reported on about 1,230,000 tons of hay harvested in the 1951 season. The basic information for estimating numbers of balers and field forage harvesters was obtained a year earlier on a similar type of schedule.

The detail contained in the four studies varied somewhat as new phases of hay-making methods progressed. In the 1952 study considerable detailed information was obtained regarding baling practices. Reporters listed the quantities of hay baled on their farms in 1951 with hand-tie wire balers, automatic wire, rectangular twine, and round twine balers. They reported the quantities of hay harvested on their farms in loose long or loose chopped form. Tonnages of straw baled with wire and twine balers and weights of the bales of hay and straw were listed by the farmers who reported.

Farmers who owned balers reported the make, model, and year of manufacture of each baler on their farms on January 1, 1952. They also reported the total quantities of hay, straw, and other materials baled, as well as the tonnages baled on their own farms in 1951, and the quantities of wire and twine used by each baler.

THE HAY CROP

Of the 108 million tons of hay produced in the United States in 1951, about 40 percent was reported as alfalfa and 30 percent as clover and timothy. One or more of these three hays were reported grown in all States except South Carolina and Florida (table 1).

Alfalfa was grown extensively in the Pacific, Mountain, and Lake States, where more than 50 percent of all hay was alfalfa. In four of the Mountain States--Arizona, Idaho, New Mexico, and Utah--more than 80 percent of the 1951 hay crop was alfalfa. Production of clover and timothy was heavy in the Northeastern States, where two-thirds of all hay was of this mixture. Clover and timothy also made up significant parts of the hay crops of the Corn Belt, the Lake States, West Virginia, and Virginia.

Wild hay made up 11 percent of all hay and was harvested chiefly in the Great Plains States, Oklahoma, and the Mountain States.

In the South, other kinds of hay, such as peanut, lespedeza, cowpea, and some soybeans and grain cut green for hay, made up the bulk of the hay crop of 1951.

Table 1.- Production of hay for specified years, and composition of the crop in 1951, by States

Group and State	Production		Composition, 1951				Estimated percentage used for alfalfa meal 1/	
	1944	1948	1951	Alfalfa:	Clover:	All other hay:	Per-	Per-
	1,000 tons	1,000 tons	1,000 tons	cent	cent	cent	cent	cent
Northeast								
New England	3,395	3,625	3,572	5.6	61.9	32.5	--	--
New York	5,759	6,016	5,678	14.7	69.7	15.6	2/	2/
New Jersey	402	428	467	38.6	45.4	16.0	--	--
Pennsylvania	3,597	3,210	3,544	19.1	75.7	5.2	0.7	0.7
Delaware	98	102	100	16.0	44.0	40.0	--	--
Maryland	552	643	683	20.6	60.3	19.1	--	--
Total	13,803	14,024	14,044	14.6	67.8	17.6	--	--
Corn Belt								
Ohio	3,622	3,408	3,916	24.1	72.4	3.5	1.3	1.3
Indiana	2,626	2,251	2,651	33.2	55.4	11.4	.2	.2
Illinois	3,938	3,558	4,736	44.2	45.7	10.1	.1	.1
Iowa	5,836	3,955	6,948	40.5	56.3	2.4	.3	.3
Missouri	4,171	4,564	4,790	17.3	27.6	52.5	.6	.6
Total	20,193	17,736	23,041	32.8	50.8	15.6	.5	.5
Lake States								
Michigan	3,895	3,346	3,882	49.3	43.8	6.9	.5	.5
Wisconsin	6,929	5,432	8,936	56.2	40.7	2.3	2/	2/
Minnesota	6,640	5,293	6,921	57.7	23.5	4.8	.2	.2
Total	17,464	14,071	19,739	55.4	35.3	4.0	.2	.2
Great Plains								
North Dakota	3,305	2,901	3,077	22.2	--	18.0	--	--
South Dakota	3,637	3,451	4,346	34.9	1.2	7.5	.1	.1
Nebraska	4,865	4,532	6,157	48.5	3.8	4.2	4.3	4.3
Kansas	2,982	3,479	3,467	61.1	5.3	10.6	4.6	4.6
Total	14,789	14,363	17,047	42.8	2.8	8.8	2.4	2.4

- Continued

Table 1.- Production of hay for specified years, and composition of the crop in 1951, by States
- Continued

Group and State	Production			Composition, 1951						Estimated percentage used for alfalfa meal 1/
	1944	1948	1951	Alfalfa:	Clover:	Wild hay:	All other:	Per-	Per-	
	tons	tons	tons	Per-	Per-	Per-	Per-	cent	cent	
Appalachian	1,000	1,000	1,000	Per-	Per-	Per-	Per-	cent	cent	
West Virginia	904	1,026	1,048	12.1	57.1	--	30.8	--	--	
Kentucky	1,831	2,130	2,277	17.1	21.6	--	61.3	--	--	
Tennessee	1,660	1,881	1,666	13.4	10.5	--	76.1	0.1	0.1	
Virginia	1,405	1,722	1,641	17.6	32.6	--	49.8	--	--	
North Carolina:	1,263	1,328	1,209	10.6	9.8	--	79.6	--	--	
Total	7,063	8,087	7,841	14.7	24.5	--	60.8	2/	2/	
Southeast										
South Carolina:	400	449	371	--	--	--	100.0	--	--	
Georgia	689	791	622	2.4	2.9	--	94.7	--	--	
Florida	64	77	57	--	--	--	100.0	--	--	
Alabama	730	720	563	5.9	3.2	--	90.9	.2	.2	
Total	1,883	2,037	1,613	3.0	2.2	--	94.8	.1	.1	
Delta										
Mississippi	1,104	933	774	2.0	7.8	--	90.2	--	--	
Louisiana	395	329	344	9.9	9.3	--	80.8	.3	.3	
Arkansas	1,529	1,503	1,294	7.6	2.9	13.2	76.3	1.1	1.1	
Total	3,028	2,765	2,412	6.1	5.3	7.1	81.5	.6	.6	
Okla-Texas										
Oklahoma:	1,671	1,975	1,796	40.2	--	26.2	33.6	1.1	1.1	
Texas	1,439	1,556	1,456	29.2	--	10.2	60.6	2.6	2.6	
Total	3,110	3,531	3,252	35.3	--	19.0	45.7	1.8	1.8	

- Continued

Table 1.- Production of hay for specified years, and composition of the crop in 1951, by States
- Continued

Group and State	Production			Composition, 1951					Estimated percentage used for alfalfa meal 1/
	1944	1948	1951	Alfalfa:	Clover:	Wild	All		
	1,000 tons	1,000 tons	1,000 tons	Per cent	Per cent	Per cent	Per cent	Per cent	
Mountain									
Montana	2,689	2,704	2,363	43.1	14.1	25.4	17.4	--	
Idaho	2,445	2,171	2,281	82.8	7.4	6.2	3.6	1.2	
Wyoming	1,312	960	1,255	42.9	12.3	32.0	12.8	--	
Colorado	2,331	2,251	2,026	66.2	10.2	17.0	6.6	5.2	
New Mexico	479	430	418	81.1	4.1	4.3	10.5	1.4	
Arizona	723	537	634	86.1	--	--	13.9	2.9	
Utah	1,245	1,129	1,023	81.1	4.8	10.4	3.7	--	
Nevada	617	577	594	50.0	10.1	35.3	4.6	.5	
Total	11,841	10,759	10,594	64.2	9.3	17.2	9.3	1.5	
Pacific									
Washington	1,775	1,611	1,431	43.4	--	4.7	51.9	--	
Oregon	1,996	1,846	1,551	37.1	25.5	19.9	17.5	.4	
California	5,944	5,342	5,426	78.9	3.7	3.1	14.3	5.0	
Total	9,715	8,799	8,408	65.1	7.1	6.5	21.3	3.1	
United States	102,889	96,172	107,991	39.5	29.9	11.2	19.4	1.0	

1/ Based on reports of the Production and Marketing Administration, U. S. Dept. of Agriculture.
2/ Less than .05 percent.

HARVESTING METHODS

Many farmers put up more hay in less time and with less hard work in 1951 than in 1944 or 1948. But haymaking remains one of the big jobs on many farms, and especially where large tonnages of hay are harvested.

A rapid change in the way hay is handled took place after the early 1940's. In 1951, approximately 62 percent of the entire hay crop of the United States was baled compared with only 14 percent of the crop that was baled in 1939 (table 2). This great increase was brought about by the development and ready acceptance by farmers of the automatic baler. From 1944 to 1951, baling with twine increased from an estimated 2 percent of the entire hay crop to 38 percent. Although the proportion of the crop baled with wire changed very little between 1944 and 1951, baling with automatic wire-tie balers increased substantially. The loose hay put up in 1944 amounted to 73 percent of the total crop. By 1948, the percentage of the crop handled as loose hay had decreased to 52 percent, and by 1951 to 38 percent. Most of the loose hay is handled as long hay. Less than 2 percent was chopped in 1944, 6 percent in 1948, and 7 percent in 1951.

All States reported sizable increases in baling hay from 1944 to 1951 (table 3). Also, the percentage of the crop that was chopped increased considerably in most States during this period. This was reflected in decreases in the percentage of the crop handled as long loose hay in all States.

The Northeastern States showed the greatest percentage increase in baling hay, going from 16 percent in 1944 to 47 percent in 1948 and to 66 percent in 1951. Growers in the Oklahoma-Texas area reported baling 68 percent of the hay in 1944. In that year more than 45 percent of the hay was baled in the Delta, Pacific, and Southeastern States. By 1951, the two latter areas were baling more than 75 percent of the crop and the Delta more than 70 percent.

The practice of chopping hay increased more in the Lake States than elsewhere in the country. There, only 1 percent of the crop was chopped in 1944, compared with 9 percent in 1948 and almost 14 percent in 1951. The Southern States reported very little chopping at any time.

In 1944 more than 80 percent of the hay in the Lake, Plains, and Northeastern States was put up as long loose hay. But, by 1951, these areas were handling less than 50 percent of the crop as long loose hay. In Oklahoma-Texas only 9 percent of the hay was put up as long loose hay in 1951, and in the Pacific States only 13 percent was so handled.

Table 3.—Percentage of hay harvested by different methods, by States, specified years

Group and State	Percentage of crop															
	1944				1948				1951							
	Baled with	Hand-	Baled with	Hand-	Baled with	Hand-	Baled with	Hand-	Baled with	Hand-	Baled with	Hand-	Wire balers	Twine balers	Chop-	Hand-
	cent	cent	cent	cent	cent	cent	cent	cent	cent	cent	cent	cent	cent	cent	cent	cent
	2.1	2.3	1.0	94.6	5.0	33.0	4.0	58.0	2.5	2.0	47.0	4.5	4.0	5.5	4.0	40.0
New England	9.1	8.6	1.5	80.8	12.0	35.0	3.0	50.0	4.0	7.5	51.0	5.5	5.5	5.5	5.5	26.5
New York	6.9	29.0	.9	63.2	14.0	63.0	1.0	22.0	3.5	5.5	70.5	5.5	5.5	5.5	2.0	13.0
New Jersey	11.8	9.8	.8	77.6	13.0	35.0	5.0	47.0	4.0	6.5	51.5	4.5	4.5	4.5	3.0	30.5
Pennsylvania	7.0	19.9	1.1	72.0	10.0	60.0	5.0	22.0	2.0	7.0	71.0	5.5	5.5	5.5	3.0	11.5
Delaware	10.7	18.5	.6	70.2	16.0	50.0	1.5	32.5	3.0	8.5	58.5	6.5	6.5	6.5	2.5	21.0
Maryland	8.1	8.4	1.1	82.4	10.7	36.2	3.6	49.5	3.5	5.8	51.3	5.1	4.2	4.2	4.2	30.1
Total	10.3	20.7	.9	68.1	21.0	31.0	4.0	44.0	7.0	10.0	44.0	7.0	7.5	10.0	7.5	24.5
Corn Belt	10.5	30.7	2.4	56.4	34.0	33.0	6.0	27.0	10.5	13.5	43.5	10.0	12.0	10.0	12.0	10.5
Ohio	9.9	38.3	1.3	50.5	40.0	30.0	7.0	23.0	12.5	18.0	42.5	9.5	8.0	9.5	8.0	9.5
Indiana	7.0	22.9	1.5	68.6	27.0	25.0	12.0	36.0	9.5	14.0	33.5	11.0	13.0	11.0	13.0	19.0
Illinois	23.7	16.7	.8	58.8	36.0	27.0	2.0	35.0	7.5	14.0	44.5	12.5	3.0	12.5	3.0	18.5
Iowa	12.1	25.2	1.3	61.4	31.7	28.7	6.1	33.5	9.4	14.1	40.6	10.2	8.8	10.2	8.8	16.9
Missouri	5.9	13.3	1.0	79.8	18.0	20.0	5.0	57.0	7.5	9.0	30.0	9.5	12.5	9.5	12.5	31.5
Total	5.0	7.0	1.4	86.6	11.0	15.0	17.0	57.0	4.5	7.5	26.0	5.0	20.0	5.0	20.0	37.0
Lake States	4.4	7.0	.7	87.9	14.0	21.0	3.5	61.5	5.5	9.5	31.0	7.0	6.0	7.0	6.0	41.0
Michigan	5.0	8.4	1.0	85.6	13.8	18.4	9.1	58.7	5.4	8.5	28.6	6.6	13.6	6.6	13.6	37.3
Wisconsin																
Minnesota																
Total																

— Continued

Table 3.- Percentage of hay harvested by different methods, by States, specified years - Continued

Group and State	Percentage of crop															
	1914				1918				1921				1924			
	Baled with -	Stationary balers	Chopped	Hand-dled	Baled with -	Stationary balers	Chopped	Hand-dled	Baled with -	Stationary balers	Chopped	Hand-dled	Baled with -	Stationary balers	Chopped	Hand-dled
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Great Plains																
North Dakota	0.9	0.7	0.3	98.1	6.0	8.0	2.0	84.0	1.0	7.0	24.5	9.0	2.0	56.5		
South Dakota	3.3	3.0	.5	93.2	6.0	14.0	2.5	77.5	2.0	5.0	20.5	12.5	3.0	57.0		
Nebraska	6.9	8.7	.7	83.7	14.0	7.0	6.0	73.0	7.0	9.5	9.5	11.0	7.5	55.5		
Kansas	17.9	22.1	1.8	58.2	39.0	29.0	5.0	27.0	15.0	18.0	28.5	14.5	7.0	17.0		
Total	6.9	8.2	.8	84.1	16.5	14.2	4.1	65.2	6.3	9.6	18.9	11.7	5.3	48.2		
Appalachian																
West Virginia	6.7	.3	.4	92.6	5.0	10.0	1.5	83.5	3.5	4.5	24.0	3.0	2.5	62.5		
Kentucky	34.7	12.2	2/	53.1	33.0	31.0	1.5	34.5	14.0	9.5	45.0	3.5	2.0	26.0		
Tennessee	32.6	6.3	2/	61.1	33.0	23.0	.5	43.5	10.5	12.0	40.0	4.0	2.0	31.5		
Virginia	13.5	4.6	2/	81.9	19.0	25.0	4.0	52.0	6.5	6.0	48.0	6.0	2.0	31.5		
North Carolina	30.5	4.4	.1	65.0	37.0	19.0	1.5	42.5	28.0	4.5	21.0	5.0	2.0	39.5		
Total	25.6	6.4	.1	67.9	27.1	23.2	1.8	47.9	12.4	7.9	38.0	4.3	2.1	35.3		
Southeast																
South Carolina	35.9	2.6	2/	61.5	49.0	17.0	2.0	32.0	30.0	4.5	25.0	9.0	2.0	29.5		
Georgia	35.6	4.6	2/	59.8	63.0	9.0	3.0	25.0	55.0	5.0	16.5	5.5	2.5	15.5		
Florida	50.8	4.0	2/	45.2	71.0	6.0	3.0	20.0	57.0	12.0	10.5	2.5	2.0	16.0		
Alabama	50.2	2.4	2/	47.4	59.0	11.0	1.4	28.6	43.5	7.0	19.5	6.0	2.0	22.0		
Total	41.8	3.3	2/	54.9	58.8	11.4	2.2	27.6	45.3	5.8	19.3	6.4	2.2	21.0		
Delta																
Mississippi	31.2	8.6	2/	60.2	50.0	12.0	.5	37.5	22.0	9.0	31.0	6.5	.5	31.0		
Louisiana	32.6	9.5	2/	57.9	41.0	23.0	2.0	34.0	20.0	8.0	40.0	8.0	2.0	22.0		
Arkansas	45.3	7.7	2/	47.0	56.0	14.0	1.0	29.0	21.0	12.5	28.0	10.5	3.0	25.0		
Total	38.5	8.3	2/	53.2	52.2	14.4	.9	32.5	21.2	10.7	30.7	8.9	2.0	26.5		

- Continued

Table 3.- Percentage of hay harvested by different methods, by States, specified years - Continued

Group and State	Percentage of crop											
	1944			1948			1951					
	Baled with	Stationary	Hand-dled	Baled with	Stationary	Hand-dled	Baled with	Stationary	Hand-dled	Baled with	Stationary	Hand-dled
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Oklahoma	35.8	30.4	2/	70.0	17.0	2.0	11.0	32.0	26.0	28.0	5.0	2.0
Texas	51.5	19.0	2/	60.0	17.0	1.5	21.5	36.0	20.0	24.0	6.0	3.0
Total	43.1	25.1	2/	65.6	17.0	1.8	15.6	33.8	23.3	26.2	5.4	2.5
Mountain												
Montana	4.2	3.3	1.7	90.8	12.0	5.0	74.0	5.0	10.0	22.0	3.0	6.0
Idaho	2.9	7.3	7.1	82.7	13.0	14.0	57.0	12.0	9.0	23.5	4.5	10.0
Wyoming	5.5	4.0	.1	90.4	11.0	6.0	75.0	6.0	12.0	17.5	6.0	5.0
Colorado	9.8	3.5	1.5	85.2	17.0	10.0	67.0	10.0	17.5	18.0	2.0	11.0
New Mexico	34.1	25.7	1.0	39.2	70.0	8.0	17.0	32.0	35.0	16.0	1.5	5.0
Arizona	14.6	45.4	2.0	38.0	65.0	10.0	17.0	44.0	33.0	8.0	1.0	9.0
Utah	6.3	15.6	3.1	75.0	23.0	8.0	53.0	14.5	19.0	20.0	1.5	9.5
Nevada	3.8	26.3	4.3	65.6	36.0	5.0	44.0	18.0	22.0	15.0	3.0	8.0
Total	7.2	10.2	2.9	79.7	19.8	8.7	60.2	12.6	15.3	19.4	3.2	8.3
Pacific												
Washington	13.7	12.3	7.0	67.0	26.0	10.0	43.0	17.0	16.0	26.0	5.0	9.0
Oregon	11.9	14.7	7.7	65.7	26.0	11.0	44.0	14.0	19.5	22.5	4.0	10.0
California	29.0	29.6	6.7	34.7	75.0	8.0	14.0	48.0	35.0	3.0	1.0	8.0
Total	22.7	23.4	7.0	46.9	55.7	9.0	25.6	36.4	28.9	10.5	2.3	8.5
United States	13.2	13.6	1.7	71.5	26.7	5.6	46.9	11.6	12.2	30.8	7.1	7.5

1/ Harvesting Hay and Silage. U. S. Bur. Agr. Econ., F.M. 79, 18 pp., illus., 1950 (Processed), with some revisions.
2/ No information obtained.

HARVESTING LARGE AND SMALL CROPS

The quantity of hay harvested per farm affected the percentage of the crop handled by different methods. Automatic pickup balers were used for baling more of the crop as the quantity harvested per farm increased (table 4). Likewise, the percentage of the crop that was chopped tended to increase with the size of the hay enterprise. This caused a general decline in the percentage handled as long loose hay as the quantity harvested increased.

In all areas except the Pacific Coast States, hand-tie balers were used relatively more on smaller than on larger farms.

Baling with twine was relatively important on large hay farms in the Northeast, Appalachian, and Corn Belt States. Wire baling was important on the larger farms in the Pacific, Oklahoma-Texas, and Southeast.

In all States, the amount of chopping done tended to increase along with an increase in the quantity of hay produced per farm.

Handling hay in long loose form increased along with the quantity harvested only in the Plains States. About 45 percent of the crop in these States is wild hay (table 1). Much of this hay is handled as long loose hay.

BALING WITH WIRE AND TWINE

Information published in the 1918 Yearbook of the United States Department of Agriculture showed that nearly a fourth of the hay crop was usually baled at that time (table 2). In 1939, less than 15 percent of the crop was baled. According to these estimates around 6 million tons more hay was baled in 1918 than was baled in 1939. In 1918, work animals were still used extensively in cities, coal mines, oil fields, lumbering, and cavalry units. Hay shipped to feed these horses, in addition to that shipped for feeding on farms, probably contributed to the higher percentage of baling in 1918. Stationary wire balers were used for all of the baling until about 1930. In 1939, only 2.5 percent of the baling was done with pickup balers.

By 1944 about 27 percent of the hay was baled and pickup balers were used as extensively as stationary balers. Most pickup balers used wire ties and the bales were hand-tied. In the Corn Belt, Oklahoma-Texas, and the Pacific States, pickup balers were used for baling about 25 percent of the hay crop.

After 1944 the influence of the twine-tie automatic baler was evident. More hay was baled for use on the farms on which it was grown and baling of hay increased very rapidly. Between 1948 and 1951 only the Mountain and Pacific States reported significant increases in wire baling. Use of coil-wire automatic balers was responsible for maintaining the percentage of the crop baled with wire at near the 1948 level.

Table 4.- Hay harvested and percentage distribution of crop, by method of harvesting, specified tonnage per farm, by areas, 1951

Item	Hay harvested: 1/	Percentage of crop					
		Baled with -				Loose hay	
		Wire	Twine			Chop- ped	Long
		Hand- tie balers	Coil- wire balers	Rectan- gular balers	Round balers		
		1,000 tons	Percent	Percent	Percent	Percent	Percent
Hay harvested per farm:							
Northeast							
Less than 10 tons	421	4	8	37	5	2	44
10-24 "	1,407	6	7	41	4	3	39
25-49 "	2,669	4	6	42	6	4	38
50-99 "	4,776	4	5	47	5	4	35
100 and over "	4,771	2	6	65	5	5	17
All farms	11,044	3.5	5.8	51.3	5.1	4.2	30.1
Corn Belt							
Less than 10 tons	691	13	16	37	4	1	29
10-24 "	4,609	11	15	36	10	4	24
25-49 "	7,147	10	15	39	10	7	19
50-99 "	6,218	8	13	44	10	11	14
100 and over "	4,376	8	13	44	12	15	8
All farms	23,041	9.4	14.1	40.6	10.2	8.8	16.9
Lake States							
Less than 10 tons	395	9	6	32	8	3	42
10-24 "	2,368	6	8	30	6	8	42
25-49 "	6,711	6	8	26	6	10	44
50-99 "	6,711	5	8	25	7	16	39
100 and over "	3,554	4	11	39	7	21	18
All farms	19,739	5.4	8.5	28.6	6.6	13.6	37.3
Plains							
Less than 10 tons	170	12	14	18	10	3	43
10-24 "	1,536	11	11	20	11	4	43
25-49 "	3,410	9	11	20	10	5	45
50-99 "	4,433	8	9	19	11	5	48
100 and over "	7,498	3	9	18	13	6	51
All farms	17,047	6.3	9.6	18.9	11.7	5.3	48.2
Appalachian							
Less than 10 tons	1,411	18	5	21	4	2	50
10-24 "	1,959	14	8	29	4	2	43
25-49 "	1,885	13	8	38	4	2	35
50-99 "	1,491	8	9	47	4	2	30
100 and over "	1,095	7	10	64	6	3	10
All farms	7,841	12.4	7.9	38.0	4.3	2.1	35.3

- Continued

Table 4.- Hay harvested and percentage distribution of crop, by method of harvesting, specified tonnage per farm, by areas, 1951 - Continued

Item		Percentage of crop						
		Baled with -				Loose hay		
		Hay	Wire	Twine				
		harvested:	Hand-	Coil =	Rectan-	Round	Chop-	Long
		1/	tie	wire	gular	Round	ped	Long
			balers:	balers	balers:	balers:		
		1,000 tons	Percent	Percent	Percent	Percent	Percent	Percent
Hay harvested per farm:								
Southeast								
Less than 10 tons	:	645	51	3	9	3	2	32
10-24 "	:	387	50	4	17	7	2	20
25-49 "	:	162	42	5	26	8	2	17
50-99 "	:	129	37	8	32	11	2	10
100 and over "	:	290	32	11	36	10	3	5
All farms	:	1,613	45.3	5.8	19.3	6.4	2.2	21.0
Delta								
Less than 10 tons	:	507	21	7	14	5	1	52
10-24 "	:	579	23	8	27	8	1	33
25-49 "	:	482	23	11	32	8	2	24
50-99 "	:	289	21	14	36	13	2	14
100 and over "	:	555	18	15	46	12	4	5
All farms	:	2,412	21.2	10.7	30.7	8.9	2.0	26.5
Oklahoma-Texas								
Less than 10 tons	:	521	39	17	16	2	2	24
10-24 "	:	683	38	25	21	3	1	12
25-49 "	:	585	38	24	23	7	2	6
50-99 "	:	391	29	26	27	10	2	6
100 and over "	:	1,072	28	24	36	6	4	2
All farms	:	3,252	33.8	23.3	26.2	5.4	2.5	8.8
Mountain								
Less than 10 tons	:	106	16	6	12	3	3	60
10-24 "	:	423	12	13	11	3	5	56
25-49 "	:	1,059	15	11	14	4	7	49
50-99 "	:	1,484	14	11	18	4	7	46
100 and over "	:	7,522	12	17	21	3	9	38
All farms	:	10,594	12.6	15.3	19.4	3.2	8.3	41.2
Pacific								
Less than 10 tons	:	83	12	10	16	3	5	54
10-24 "	:	336	16	15	18	3	11	37
25-49 "	:	673	17	15	18	4	14	32
50-59 "	:	841	19	16	20	3	15	27
100 and over "	:	6,475	42	33	8	2	7	8
All farms	:	8,408	36.4	28.9	10.5	2.3	8.5	13.4

- Continued

Table 4.- Hay harvested and percentage distribution of crop, by method of harvesting, specified tonnage per farm, by areas, 1951 - Continued

Item	Hay harvested:	Percentage of crop					
		Baled with -			Loose hay		
		Wire	Twine				
		Hand- : Coil- : Rectan- : Round : Chop- : Long					
	1/	tie : wire : gular : balers:	balers:	balers:	balers:	ped :	
		1,000 tons	Percent	Percent	Percent	Percent	Percent
Hay harvested per farm:							
United States							
Less than 10 tons	4,950	22	9	22	4	2	41
10-24 "	14,287	13	12	30	7	4	34
25-49 "	24,783	10	11	31	7	7	34
50-99 "	26,763	8	10	33	8	9	32
100 and over "	37,208	13	16	30	7	9	25
All farms	107,991	11.6	12.2	30.8	7.1	7.5	30.8

1/ The quantities of hay harvested in the different tonnage groups were estimated by distributing the regional production in 1951 to the groups in the same proportion as shown by the special enumerative survey covering the 1947 hay crop, April 1948.

The use of twine for tying bales increased at a phenomenal rate from its beginning around 1941. In 1951 more than half of the hay crop was baled with twine in the Northeastern and Corn Belt States. With the exception of the Pacific, Mountain, and Southeastern States, all areas baled more than 30 percent of the crop with twine. The bulk of the twine baling was done with rectangular balers. More than 10 percent of all hay was baled with round-bale twine balers in the Plains and Corn Belt States.

In 1951, twine was used for nearly 62 percent of the total baling of hay in the United States (table 5). The proportion of the baling that was done with twine ranged from a high of 86 percent in the Northeast to a low 16 percent in the Pacific States. Round bales accounted for 25 percent of the total tonnage of hay baled in the Plains States.

The percentage of the baling that was done with wire in 1951 was about equally divided between that done with hand-tie and coil-wire automatic balers. Hand-tie balers were used extensively in the Southeastern and Pacific States. The Pacific and Mountain States used coil-wire balers for a substantial part of the baling done in 1951.

CUSTOM BALING

Many farms which produce small tonnages of hay have it baled by custom operators. In 1951 custom baling was also used extensively on farms that produced 100 or more tons of hay (table 6). Because of labor shortages some farmers who owned stationary or hand-tie pickup balers had their hay custom baled with automatic-tie balers.

Table 5.- Hay baled and percentage distribution, by type of baler, by States, 1951 1/

Group and State	Estimated: Hay baled with -				
	quantity	Hand-tie:	Coil-	Rectangular:	Round
	of	wire	wire	twine	twine
	hay baled:	balers	balers	balers	balers
	: 1,000 tons	Percent	Percent	Percent	Percent
Northeast	:				
New England	: 2,000	4	4	84	8
New York	: 3,860	6	11	75	8
New Jersey	: 397	4	7	83	6
Pennsylvania	: 2,357	6	10	77	7
Delaware	: 85	3	8	83	6
Maryland	: 522	4	11	76	9
Total	: 9,221	5.3	8.8	78.1	7.8
Corn Belt	:				
Ohio	: 2,663	10	15	65	10
Indiana	: 2,054	14	17	56	13
Illinois	: 3,907	15	22	52	11
Iowa	: 4,724	14	21	49	16
Missouri	: 3,760	9	18	57	16
Total	: 17,108	12.7	19.0	54.6	13.7
Lake States	:				
Michigan	: 2,174	13	16	54	17
Wisconsin	: 3,843	11	17	60	12
Minnesota	: 3,669	10	18	59	13
Total	: 9,686	11.0	17.3	58.3	13.4
Great Plains	:				
North Dakota	: 1,276	2	17	59	22
South Dakota	: 1,736	5	13	51	31
Nebraska	: 2,429	18	24	30	28
Kansas	: 2,736	20	23	37	20
Total	: 8,177	13.5	20.0	41.7	24.8
Appalachian	:				
West Virginia	: 367	10	13	68	10
Kentucky	: 1,637	19	13	63	5
Tennessee	: 1,106	16	18	60	6
Virginia	: 1,089	10	9	72	9
North Carolina	: 706	48	8	26	8
Total	: 4,905	19.8	12.6	60.7	6.9
Southeast	:				
South Carolina	: 254	44	7	36	13
Georgia	: 509	67	6	20	7
Florida	: 47	69	15	13	3
Alabama	: 426	57	9	26	8
Total	: 1,238	59.0	7.6	25.1	8.3

- Continued

Table 5.- Hay baled and percentage distribution, by type of baler, by States, 1951 ^{1/} - Continued

Group and State	:Estimated : Hay baled with -				
	: quantity	: Hand-tie:	: Coil-	: Rectangular:	: Round
	: of	: wire	: wire	: twine	: twine
	: hay baled	: balers	: balers	: balers	: balers
	: <u>1,000 tons</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Delta	:	:	:	:	:
Mississippi	: 530	32	13	45	10
Louisiana	: 261	26	11	53	10
Arkansas	: 932	29	17	39	15
Total	: 1,723	29.7	15.0	42.9	12.4
Okla-Texas	:	:	:	:	:
Oklahoma	: 1,631	35	29	31	5
Texas	: 1,251	42	23	28	7
Total	: 2,882	38.1	26.3	29.5	6.1
Mountain	:	:	:	:	:
Montana	: 944	12	25	55	8
Idaho	: 1,116	25	18	48	9
Wyoming	: 521	14	30	42	14
Colorado	: 961	21	37	38	4
New Mexico	: 353	38	41	19	2
Arizona	: 545	51	38	9	1
Utah	: 563	26	35	36	3
Nevada	: 344	31	38	26	5
Total	: 5,347	25.0	30.3	38.4	6.3
Pacific	:	:	:	:	:
Washington	: 915	26	25	41	8
Oregon	: 929	23	32	38	7
California	: 4,715	55	40	4	1
Total	: 6,559	46.6	37.0	13.5	2.9
United States	: 66,846	18.8	19.7	49.9	11.6

^{1/} Developed from data on the percentage of the hay crop baled, table 3.

Table 6.- Hay harvested and percentage of baling hired and not hired, by specified tonnage harvested per farm, by areas, 1951 1/

Item	:	Hay harvested	Percentage of hay baling	
			Hired	Not hired
			Percent	Percent
Hay harvested per farm:	:	1,000 tons		
Northeast	:			
Less than 10 tons	:	421	98	2
10-24 "	:	1,407	92	8
25-49 "	:	2,669	79	21
50-99 "	:	4,776	58	42
100 and over "	:	4,771	23	77
All farms	:	14,044	54.7	45.3
Corn Belt	:			
Less than 10 tons	:	691	94	6
10-24 "	:	4,609	91	9
25-49 "	:	7,147	82	18
50-99 "	:	6,218	60	40
100 and over "	:	4,376	36	64
All farms	:	23,041	69.5	30.5
Lake States	:			
Less than 10 tons	:	395	96	4
10-24 "	:	2,368	91	9
25-49 "	:	6,711	82	18
50-99 "	:	6,711	74	26
100 and over "	:	3,554	38	62
All farms	:	19,739	72.7	27.3
Plains	:			
Less than 10 tons	:	170	96	4
10-24 "	:	1,536	97	3
25-49 "	:	3,410	83	17
50-99 "	:	4,433	68	32
100 and over "	:	7,498	33	67
All farms	:	17,047	58.5	41.5
Appalachian	:			
Less than 10 tons	:	1,411	91	9
10-24 "	:	1,959	82	18
25-49 "	:	1,885	74	26
50-99 "	:	1,491	59	41
100 and over "	:	1,095	23	77
All farms	:	7,841	69.1	30.9
Southeast	:			
Less than 10 tons	:	645	86	14
10-24 "	:	387	67	33
25-49 "	:	162	48	52
50-99 "	:	129	31	69
100 and over "	:	290	13	87
All farms	:	1,613	60.1	39.9

Table 6.- Hay harvested and percentage of baling hired and not hired, by specified tonnage harvested per farm, by areas, 1951 ¹/₂ - Continued

Item	:	Hay harvested	Percentage of hay baling	
			Hired	Not hired
		1,000 tons	Percent	Percent
Hay harvested per farm:	:			
Delta	:			
Less than 10 tons	:	507	88	12
10-24 "	:	579	82	18
25-49 "	:	482	72	28
50-99 "	:	289	55	45
100 and over "	:	555	23	77
All farms	:	2,412	64.4	35.6
Oklahoma and Texas	:			
Less than 10 tons	:	521	93	7
10-24 "	:	683	89	11
25-49 "	:	585	82	18
50-99 "	:	391	72	28
100 and over "	:	1,072	42	58
All farms	:	3,252	70.8	29.2
Mountain	:			
Less than 10 tons	:	106	87	13
10-24 "	:	423	91	9
25-49 "	:	1,059	84	16
50-99 "	:	1,484	74	26
100 and over "	:	7,522	30	70
All farms	:	10,594	44.6	55.4
Pacific	:			
Less than 10 tons	:	83	99	1
10-24 "	:	336	94	6
25-49 "	:	673	86	14
50-99 "	:	841	66	34
100 and over "	:	6,475	42	58
All farms	:	8,408	50.6	49.4
United States	:			
Less than 10 tons	:	4,950	92	8
10-24 "	:	14,287	89	11
25-49 "	:	24,783	81	19
50-99 "	:	26,763	65	35
100 and over "	:	37,208	33	67
All farms	:	107,991	62.3	37.7

¹/₂ Hay harvested developed the same way as in table 4.

In a few instances, temporary local shortages of wire or twine caused farmers to hire their hay baled even though they owned balers.

Generally, the more hay harvested per farm the lower the percentage that was custom baled.

It is estimated that around 62 percent of all baling done in 1951 was hired. More baling was hired in the Lake States and Oklahoma-Texas than elsewhere. In these States more than 70 percent of the baling was done by custom operators. In the Mountain States only 45 percent of all hay baled in 1951 was hired.

Farmers who produced small tonnages of hay and did their own baling may have had stationary balers or they may have bought old pickup balers, or had balers mainly for doing custom work. Some of the baling on farms producing small quantities of hay was done with balers owned by several farmers. Income from custom baling helps the owner of the baler to pay for it, and enables many farmers to have their hay baled. The chief disadvantage of depending on custom baling is that frequently a farmer cannot get his hay baled exactly when it is ready.

NUMBER OF BALERS AND AVERAGE USE

Numbers of windrow pickup balers on farms have increased rapidly since 1942 (table 7). Numbers of stationary balers on farms have declined in recent years and many of those now on farms have not been used for several years.

On January 1, 1952, the Northeastern, Corn Belt, and Lake States had about 56 percent of the pickup balers. The Southern States had around 70 percent of the stationary balers.

In the Northeastern States, approximately 80 percent of all pickup balers on farms in 1952 were twine balers and 20 percent were wire balers. In the other Northern groups of States the number of twine balers exceeded the number of wire balers by a considerable margin (table 8).

In the Pacific Coast States, the number of wire pickup balers exceeded the number of twine balers by more than two to one. In the Mountain, Oklahoma-Texas, and Southeastern groups of States, wire balers exceeded twine balers in number by a small margin.

Generally, as the number of balers on farms increased the average number of tons baled per baler decreased. It is estimated that in 1951 pickup balers were baling about 250 tons of hay, straw, and other products per baler (table 9). Coil-wire automatic balers averaged around 380 tons per baler. Each kind of baler was used more in the West than in other parts of the country. The South reported the smallest use per baler for all types of balers.

Table 7.- Number of balers and field forage harvesters on farms, by States, specified dates

Group and State	: Windrow pickup balers : Stationary balers : Field forage harvesters							
	: 1942 : 1950 :		: 1952 :		: 1942 : 1952 :		: 1950 : 1951 : 1952	
	: Jan. 1: April 1: Jan. 1:		: Jan. 1 :		: Jan. 1 : Jan. 1 :		: Jan. 1 : Jan. 1 :	
	: esti- : census: esti- :		: esti- : esti- :		: esti- : esti- :		: esti- : esti- :	
	: mated :		: mated :		: mated :		: mated :	
	Number	Number	Number	Number	Number	Number	Number	Number
Northeast								
New England	: 80	3,120	4,900	340	165	1,500	1,800	2,500
New York	: 350	9,217	14,500	1,500	850	5,000	6,300	7,500
New Jersey	: 340	1,804	2,600	350	275	600	800	1,000
Pennsylvania	: 430	9,241	14,500	1,900	1,500	3,500	4,300	5,200
Delaware	: 50	405	600	100	70	100	125	150
Maryland	: 250	2,194	3,400	265	140	900	1,000	1,150
Total	: 1,500	25,976	40,500	4,455	3,000	11,600	14,325	17,500
Corn Belt								
Ohio	: 1,400	12,378	19,000	2,300	1,350	3,500	4,500	5,500
Indiana	: 1,300	9,674	14,000	2,000	850	2,200	3,000	3,700
Illinois	: 2,300	15,727	23,000	2,700	1,100	5,800	7,500	9,000
Iowa	: 2,100	13,211	20,000	2,200	1,100	6,500	9,000	12,000
Missouri	: 1,400	9,032	14,000	7,900	3,600	2,000	2,500	3,000
Total	: 8,500	60,022	90,000	17,100	8,000	20,000	26,500	33,200
Lake States								
Michigan	: 900	7,480	11,500	1,250	1,000	3,500	4,500	5,500
Wisconsin	: 1,000	8,344	13,500	550	400	13,000	15,500	18,500
Minnesota	: 600	7,812	12,000	900	1,000	7,500	9,500	11,300
Total	: 2,500	23,636	37,000	2,700	2,400	24,000	29,500	35,300
Great Plains								
North Dakota	: 200	2,404	4,000	300	2,000	2,000	2,500	3,000
South Dakota	: 100	3,005	5,000	300	300	2,000	2,500	3,000
Nebraska	: 300	4,253	6,500	1,500	1,200	3,000	3,500	4,000
Kansas	: 700	8,175	12,500	2,900	3,000	5,000	6,000	7,300
Total	: 1,300	17,837	28,000	5,000	6,500	12,000	14,500	17,300
Appalachian								
West Virginia	: 100	617	1,000	900	500	200	300	400
Kentucky	: 700	5,984	9,000	10,300	4,800	600	800	1,000
Tennessee	: 370	4,800	7,500	12,750	5,000	500	600	700
Virginia	: 250	3,576	5,500	1,300	1,700	700	900	1,100
North Carolina	: 400	5,796	9,000	6,000	6,200	200	250	300
Total	: 1,820	20,773	32,000	31,250	18,200	2,200	2,850	3,500
Southeast								
South Carolina	: 125	2,215	3,500	2,250	4,000	200	250	300
Georgia	: 250	3,795	6,000	6,800	8,400	300	375	400
Florida	: 25	310	500	750	600	50	75	100
Alabama	: 300	2,437	3,500	9,000	5,000	100	150	200
Total	: 700	8,757	13,500	18,800	18,000	650	850	1,000

- Continued

Table 7.- Number of balers and field forage harvesters on farms, by States, specified dates - Continued

Group and State	Windrow pickup balers			Stationary balers		Field forage harvesters		
	1942	1950	1952	1942	1952	1950	1951	1952
	Jan. 1:	April 1:	Jan. 1:	Jan. 1:	Jan. 1:	Jan. 1:	Jan. 1:	Jan. 1:
	esti- mated :	census:	esti- mated :	esti- mated :	esti- mated :	esti- mated :	esti- mated :	esti- mated :
	Number	Number	Number	Number	Number	Number	Number	Number
Delta								
Mississippi	400	3,294	5,000	5,200	3,500	100	200	300
Louisiana	200	1,957	2,500	5,000	2,300	100	150	200
Arkansas	400	3,282	5,500	8,200	5,400	400	500	600
Total	1,000	8,533	13,000	18,400	11,200	600	850	1,100
Oklahoma-Texas								
Oklahoma	1,400	5,166	7,000	7,000	4,700	800	900	1,000
Texas	2,600	6,041	8,000	14,700	7,300	900	1,200	1,500
Total	4,000	11,207	15,000	21,700	12,000	1,700	2,100	2,500
Mountain								
Montana	170	1,719	3,000	490	1,000	1,000	1,250	1,500
Idaho	200	2,253	3,500	450	250	1,000	1,250	1,500
Wyoming	80	668	1,000	250	250	300	400	500
Colorado	140	1,667	2,800	850	600	2,100	2,500	2,800
New Mexico	270	981	1,400	1,000	400	200	250	300
Arizona	400	623	800	350	200	250	325	400
Utah	50	1,444	2,300	250	150	400	500	600
Nevada	105	471	700	50	50	200	250	300
Total	1,415	9,826	15,500	3,690	2,900	5,450	6,725	7,900
Pacific								
Washington	250	1,919	3,000	1,000	550	800	1,000	1,200
Oregon	350	2,204	3,500	500	350	800	1,200	1,500
California	1,800	5,163	7,000	3,200	1,900	1,200	1,600	2,000
Total	2,400	9,286	13,500	4,700	2,800	2,800	3,800	4,700
United States	25,135	195,858	298,000	127,795	85,000	81,000	102,000	124,000

Table 8.- Distribution of windrow pickup balers, by type and State group, January 1, 1952

State group	Balers	Percentage distribution	
		Wire	Twine
	Number	Percent	Percent
Northeast	40,500	19	81
Corn Belt	20,000	31	69
Lake States	37,000	32	68
Great Plains	28,000	40	60
Appalachian	32,000	44	56
Southeast	13,500	53	47
Delta	13,000	45	55
Okla.-Texas	15,000	58	42
Mountain	15,500	53	47
Pacific	13,500	69	31
United States	298,000	37.6	62.4

Table 9.- Average tonnage of hay and straw baled per baler and percentage distribution of balers, by amount baled and by kind of baler, 1951

Stationary

Region	: Balers :Average:		Percentage of balers						
	: on farms :tonnage:		Used for baling						
	: Jan. 1, : per :		: Less than : 25-50 : 51-100 : 101-250 : 251-500 : 501 tons						
	: 1952 : baler :		: 25 tons : tons : tons : tons : tons : and over						
	Number	Tons	Percent	Percent	Percent	Percent	Percent	Percent	Percent
South	59,400	21	26.7	50.5	12.0	8.0	2.5	0.2	0.1
All other	25,600	37	27.7	21.3	22.8	20.5	7.5	.2	1/
United States	85,000	26	27.0	41.7	15.3	11.7	4.0	.2	.1
Pickup - hand-tie wire									
North	33,700	149	4.6	6.1	11.8	26.2	35.9	13.5	1.9
South	27,900	77	1.6	17.5	35.0	28.0	12.1	4.4	1.4
West	10,400	415	7.3	.6	1.8	11.0	40.0	21.5	17.8
United States	72,000	162	3.8	9.7	19.4	24.7	27.3	11.1	4.0
Total hand-tie wire									
North	53,600	107	13.5	12.2	16.5	23.9	24.2	8.5	1.2
South	87,300	40	18.7	39.9	19.4	14.4	5.6	1.5	.5
West	16,100	289	13.6	6.4	7.2	14.9	32.2	14.2	11.5
United States	157,000	88	16.4	27.0	17.1	17.7	14.7	5.2	1.9
Pickup - coil-wire tie									
North	25,000	365	1.1	.8	.9	8.0	34.0	33.2	22.0
South	7,900	233	1.5	1.0	9.0	12.5	49.0	15.5	11.5
West	7,100	616	1.0	.5	1.0	1.6	13.5	38.4	44.0
United States	40,000	383	1.2	.8	2.5	7.8	33.3	30.6	23.8
Total pickup-wire tie									
North	58,700	241	3.1	3.8	7.1	18.4	35.1	22.1	10.4
South	35,800	112	1.6	13.9	29.3	24.6	20.2	6.8	3.6
West	17,500	497	4.7	.6	1.5	7.2	29.2	28.4	28.4
United States	112,000	239	2.9	6.5	13.3	18.6	29.4	18.2	11.1
Pickup-twine									
North	136,800	282	.6	.2	2.0	10.4	46.4	27.3	13.1
South	37,700	166	1.5	7.0	15.0	24.2	33.3	15.0	4.0
West	11,500	337	1.0	1/	2.0	7.0	35.0	35.0	20.0
United States	186,000	262	.8	1.6	4.6	13.0	43.0	25.3	11.7
Total pickup									
North	195,500	269	1.4	1.3	3.5	12.8	43.0	25.7	12.3
South	73,500	139	1.5	10.4	22.0	24.4	26.9	11.0	3.8
West	29,000	433	3.2	.4	1.7	7.1	31.5	31.0	25.1
United States	298,000	253	1.6	3.5	7.9	15.1	37.9	22.6	11.4

1/ Less than 0.05 percent.

Most of the stationary balers were used to bale 50 tons or less while most pickup balers were used to bale 100 tons or more (table 9). Other products consisted of corn shucks, corn stalks, and weeds or hay of poor quality used for bedding.

Small numbers of automatic pickup balers on farms at the end of 1951 were not used in that year. Most of these were new balers that were bought after the baling season ended.

WEIGHTS OF BALES

Heavier bales were made when wire was used for tying than when twine was used (table 10). Also, hand-tie wire bales were usually heavier than those tied automatically with wire. Hay bales tied with hand-tie wire balers averaged more than 70 pounds per bale in most State groups. In the Pacific Coast States the average weight was around 100 pounds and in California it was 115 pounds. Bales tied with coil wire were also considerably heavier in the Pacific States than elsewhere and they were above average in the Mountain States.

About 4 percent of the farmers in the United States reported bale weights of over 100 pounds for hand-tie wire bales (table 11). In the Pacific Coast States 9 percent of the farmers reported weights of 101-124 pounds and 26 percent reported weights of 125 or more pounds per bale. A few farmers reported bales weighing as much as 250 pounds. These heavy bales were made with large three-wire balers. Most rectangular balers throughout the country are of the two-tie type.

In some areas in these States heavy bales are made for shipping. Also, the climate in the drier parts of these States permitted the hay to be thoroughly cured and condensed into heavy bales.

In humid areas, lighter bales were usually made to allow for better circulation of air and further drying. Also, when the hay is fed on the farm where it is baled, lighter bales are preferred because of ease in handling at harvest and feeding times.

The weight of hay bales tied with twine ranged from 51 to 65 pounds in the different groups of States. Straw bales were lighter than hay bales when tied with similar material. In most States, the average weight of these bales when tied with twine was less than 50 pounds. Six percent of the farmers reported twine-tied bales of straw averaging 30 pounds or less.

The quantity of wire or twine used per ton of material baled decreased generally with an increase in weight of bales. This was especially evident for all wire-tie bales in the West. Only 7.2 pounds of coil wire was used per ton baled in the Western States compared with 8.2 pounds in the Northern States and 8.1 pounds in the Southern States. In the Western States the number of wire ties per ton of material baled was 49, in the North the number was 60, and in the South, 63 (table 12). The quantity of baler twine used per ton baled varied little by regions.

Table 10.- Average weight of hay and straw bales,
by type and States, 1951

Group and State	Average weight of bales					
	Hay				Straw	
	Wire-tied		Twine-tied			
	Hand-	Coil	Rectan-	Round	Wire	Twine
	tie	wire	gular		bales	bales
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
Northeast						
New England	66	65	53	50	63	45
New York	73	68	55	56	57	43
New Jersey	68	60	54	48	60	42
Pennsylvania	86	66	52	50	67	42
Delaware	--	65	56	--	70	43
Maryland	68	63	53	53	60	41
Total	77	66	53	51	63	42
Corn Belt						
Ohio	73	67	56	54	72	46
Indiana	71	69	60	58	60	51
Illinois	71	69	61	60	62	52
Iowa	69	69	62	58	61	53
Missouri	68	67	60	59	58	50
Total	71	68	60	58	63	51
Lake States						
Michigan	74	67	60	58	56	45
Wisconsin	74	70	61	58	59	51
Minnesota	77	72	66	59	61	52
Total	75	70	62	58	59	50
Great Plains						
North Dakota	86	84	65	65	58	47
South Dakota	75	75	66	60	60	49
Nebraska	74	70	66	61	58	48
Kansas	68	68	63	61	56	53
Total	71	71	65	62	58	49
Appalachian						
West Virginia	82	68	55	54	70	46
Kentucky	74	72	62	62	64	47
Tennessee	75	71	61	60	57	45
Virginia	79	68	58	57	67	43
North Carolina	68	67	59	61	62	49
Total	73	70	60	59	64	46
Southeast						
South Carolina	68	69	57	54	57	42
Georgia	67	67	56	55	60	46
Florida	67	67	55	54	55	50
Alabama	68	65	58	51	49	48
Total	67	67	57	54	56	45

- Continued

Table 10.- Average weight of hay and straw bales,
by type and States, 1951 - Continued

Group and State	Average weight of bales					
	Hay				Straw	
	Wire-tied		Twine-tied			
	Hand- tie	Coil wire	Rectan- gular	Round	Wire bales	Twine bales
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
Delta						
Mississippi	79	65	58	66	45	45
Louisiana	59	63	56	55	58	52
Arkansas	61	66	61	56	52	45
Total	64	65	59	57	54	48
Oklahoma-Texas						
Oklahoma	70	71	66	67	52	49
Texas	64	65	60	58	56	51
Total	67	69	63	64	54	49
Mountain						
Montana	85	76	62	57	59	47
Idaho	79	76	61	68	58	46
Wyoming	79	74	65	62	70	59
Colorado	74	73	61	59	52	46
New Mexico	70	72	63	50	60	55
Arizona	76	74	73	65	64	50
Utah	80	76	64	65	58	48
Nevada	84	80	65	65	55	--
Total	78	75	62	64	58	47
Pacific						
Washington	85	79	62	55	67	48
Oregon	93	76	63	61	63	46
California	115	93	63	60	85	55
Total	98	82	62	57	70	47
United States	73	71	60	57	62	48

Table 11.- Percentage of farmers reporting different weights of bales,
by type of baler, United States, 1951

Item	Weight of bales, pounds							
	30 and less	31-40	41-50	51-60	61-70	71-80	81-100	101 and over
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Hay								
Wire balers								
Hand-tie	0	1	7	18	35	24	11	4
Automatic	0	1	5	20	39	24	9	2
Twine balers								
Rectangular	0	5	23	34	27	10	1	0
Round	1	7	24	31	26	10	1	0
Straw								
Wire balers	1	7	25	29	18	12	6	2
Twine balers	6	32	37	17	6	2	0	0

Table 12.- Wire ties, coil wire, and twine used per ton of material baled in 1951, by regions and for the United States ^{1/}

Tying	Number of ties per ton baled				United States
	: North	: South	: West	:	
Wire ties	:	:	:	:	:
Stationary balers	: 56	: 62	: 50	:	: 60
Hand-tie pickup balers	: 61	: 63	: 49	:	: 55
All hand-tie balers	: 60	: 63	: 49	:	: 56
	: Pounds of wire or twine per ton baled				
Coil wire	: 8.2	: 8.1	: 7.2	:	: 7.7
Baler twine	: 3.1	: 3.1	: 3.0	:	: 3.1
Binder twine	: 2.6	: 2.7	: 2.4	:	: 2.6

^{1/} Weighted averages of farms reporting.

Regions: North includes Northeast, Corn Belt, Lake, and Great Plains States; South includes Appalachian, Southeastern and Delta States, and Oklahoma-Texas; West includes Mountain and Pacific Coast States.

BALING STRAW

Harvesting small grains with combines and the development of the pickup baler have both contributed to an increase in the baling of straw in recent years. Less straw can be saved when grain is combined than with other harvest methods. In areas where the grain is combined and most of the straw is saved, much of this straw is baled with pickup balers. Some combines are equipped with attachments to windrow the straw; otherwise, the straw is usually windrowed with a side-delivery rake.

Straw was baled extensively in the Northern States where cattle and other livestock are important and large quantities of straw are needed for bedding. About 85 percent of all the straw baled in 1951 was in the Corn Belt, Lake, Northeastern, and Great Plains States (table 13).

Table 13.- Straw baled for use on farms or for sale, by States,
1950 and 1951

Group and State	Straw baled					
	1950 1/			1951 2/		
	Percentage			Percentage		
	with -			with -		
	Total	Wire	Twine	Total	Wire	Twine
	: balers:	balers:	balers:	: balers:	balers:	balers:
	1,000 tons	Percent	Percent	1,000 tons	Percent	Percent
Northeast						
New England	28	22	78	40	7	93
New York	358	32	68	610	25	75
New Jersey	51	28	72	60	10	90
Pennsylvania	615	24	76	665	20	80
Delaware	28	22	78	20	15	85
Maryland	137	38	62	140	27	73
Total	1,217	28.0	72.0	1,535	21.8	78.2
Corn Belt						
Ohio	852	40	60	810	27	73
Indiana	645	37	63	590	37	63
Illinois	945	49	51	1,000	37	63
Iowa	1,462	44	56	1,200	39	61
Missouri	247	48	52	225	44	56
Total	4,151	43.5	56.5	3,825	35.9	64.1
Lake States						
Michigan	503	39	61	540	27	73
Wisconsin	524	33	67	690	24	76
Minnesota	1,261	28	72	1,440	22	78
Total	2,288	31.6	68.4	2,670	23.5	76.5
Great Plains						
North Dakota	414	32	68	315	19	81
South Dakota	277	24	76	345	14	86
Nebraska	206	54	46	380	40	60
Kansas	103	50	50	90	48	52
Total	1,000	36.2	63.8	1,130	26.8	73.2
Appalachian						
West Virginia	31	48	52	40	42	58
Kentucky	88	41	59	125	36	64
Tennessee	75	36	64	105	24	76
Virginia	107	50	50	170	30	70
North Carolina	89	57	43	95	49	51
Total	390	46.7	53.3	535	34.5	65.5
Southeast						
South Carolina	44	57	43	45	23	77
Georgia	22	54	46	28	48	52
Florida	1	80	20	2	68	32
Alabama	13	58	42	20	45	55
Total	80	56.6	43.4	95	35.9	64.1

- Continued

Table 13.- Straw baled for use on farms or for sale, by States,
1950 and 1951 - Continued

Group and State	Straw baled					
	1950 1/			1951 2/		
	Percentage			Percentage		
	with -			with -		
	Total	Wire	Twine	Total	Wire	Twine
		balers	balers		balers	balers
	1,000 tons	Percent	Percent	1,000 tons	Percent	Percent
Delta						
Mississippi	21	50	50	35	20	80
Louisiana	8	56	44	25	20	80
Arkansas	7	58	42	20	22	78
Total	36	52.9	47.1	80	20.5	79.5
Okla-Texas						
Oklahoma	30	67	33	40	57	43
Texas	25	63	37	70	47	53
Total	55	65.2	34.8	110	50.6	49.4
Mountain						
Montana	149	33	67	125	20	80
Idaho	76	40	60	140	35	65
Wyoming	26	33	67	35	18	82
Colorado	48	61	39	80	47	53
New Mexico	13	66	34	15	80	20
Arizona	25	76	24	20	80	20
Utah	55	51	49	65	68	32
Nevada	6	55	45	5	60	40
Total	398	44.3	55.7	485	39.8	60.2
Pacific						
Washington	79	56	44	115	62	38
Oregon	67	62	38	120	47	53
California	126	95	5	265	98	2
Total	272	75.5	24.5	500	77.5	22.5
United States	9,887	39.4	60.6	10,965	32.0	68.0

1/ Includes wheat, oats, barley, rye, and flaxseed straw. Data from
BAE Report F.M. 91, "Harvesting Small Grains and Soybeans and Methods
of Saving Straw."

2/ Includes all kinds of straw.

The use of twine-tie balers for baling straw increased from 1950 to 1951 in all groups of States except the Pacific. More than 75 percent of the straw baled in the Delta, Northeastern, and Lake States in 1951 was baled with twine. In all groups of States, except the Pacific and Oklahoma-Texas, 60 percent or more of the straw **baling was done with twine.**

Wire-tie balers were used extensively on the Pacific Coast and in some of the Mountain States. In 1951 practically all of the baling of straw in California was done with wire.